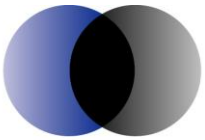
Aurora Energy 2012-13 Distribution Loss Factors

DLF calculations and methodology

Prepared for Aurora Energy for submission to the AER

February 2012



ACIL Tasman

Economics Policy Strategy

© ACIL Tasman Pty Ltd

This work is copyright. The *Copyright Act 1968* permits fair dealing for study, research, news reporting, criticism or review. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgment of the source is included. Permission for any more extensive reproduction must be obtained from ACIL Tasman on (03) 9600 3144.

Reliance and Disclaimer

The professional analysis and advice in this report has been prepared by ACIL Tasman for the exclusive use of the party or parties to whom it is addressed (the addressee) and for the purposes specified in it. This report is supplied in good faith and reflects the knowledge, expertise and experience of the consultants involved. The report must not be published, quoted or disseminated to any other party without ACIL Tasman's prior written consent. ACIL Tasman accepts no responsibility whatsoever for any loss occasioned by any person acting or refraining from action as a result of reliance on the report, other than the addressee.

In conducting the analysis in this report ACIL Tasman has endeavoured to use what it considers is the best information available at the date of publication, including information supplied by the addressee. Unless stated otherwise, ACIL Tasman does not warrant the accuracy of any forecast or prediction in the report. Although ACIL Tasman exercises reasonable care when making forecasts or predictions, factors in the process, such as future market behaviour, are inherently uncertain and cannot be forecast or predicted reliably.

ACIL Tasman shall not be liable in respect of any claim arising out of the failure of a client investment to perform to the advantage of the client or to the advantage of the client to the degree suggested or assumed in any advice or forecast given by ACIL Tasman.

ACIL Tasman Pty Ltd

ABN 68 102 652 148
Internet www.aciltasman.com.au

Melbourne (Head Office)
Level 6, 224-236 Queen Street
Melbourne VIC 3000

Telephone (+61 3) 9600 3144
Facsimile (+61 3) 9600 3155
Email melbourne@aciltasman.com.au

Brisbane
Level 15, 127 Creek Street
Brisbane QLD 4000
GPO Box 32
Brisbane QLD 4001

Telephone (+61 7) 3009 8700
Facsimile (+61 7) 3009 8799
Email brisbane@aciltasman.com.au

Canberra
Level 1, 33 Ainslie Place
Canberra City ACT 2600
GPO Box 1322
Canberra ACT 2601

Telephone (+61 2) 6103 8200
Facsimile (+61 2) 6103 8233
Email canberra@aciltasman.com.au

Darwin
Suite G1, Paspalis Centrepoint
48-50 Smith Street
Darwin NT 0800
GPO Box 908
Darwin NT 0801

Telephone (+61 8) 8943 0643
Facsimile (+61 8) 8941 0848
Email darwin@aciltasman.com.au

Perth
Centa Building C2, 118 Railway Street
West Perth WA 6005

Telephone (+61 8) 9449 9600
Facsimile (+61 8) 9322 3955
Email perth@aciltasman.com.au

Sydney
PO Box 1554
Double Bay NSW 1360

Telephone (+61 2) 9958 6644
Facsimile (+61 2) 8080 8142
Email sydney@aciltasman.com.au

For information on this report

Please contact:

Peter Crittall
Telephone (07) 3009 8718
Mobile 0413 744 967
Email p.crittall@aciltasman.com.au

ACIL Tasman
Economics Policy Strategy

Contents

Figures and tables

Executive summary

ACIL Tasman Pty Ltd (ACIL Tasman) has been engaged by Aurora Energy Pty Ltd, ABN 85 082 464 622, in its capacity as distribution network service provider (Aurora) to forecast distribution loss factors (DLF) for 2012-13, based on actual metered data for 2010-11. The National Electricity Rules (the Rules) apply to all registered industry participants including Tasmania's sole distribution network service provider (DSNP), Aurora.

Aurora provided data for the DLF calculations in an Excel workbook developed by ACIL Tasman, named "DLF Calculator 2012-13.xls". For this study, data collection and validation was improved by the initial involvement by ACIL Tasman working in Aurora's offices.

In Tasmania, the original methodology was developed and has been maintained by Aurora[1]. The Office of the Tasmanian Energy Regulator (OTTER) prior to 2008, and since then the Australian Energy Regulator (AER) have approved DLFs calculated in accordance with this methodology.

The overall DLFs for the Aurora network are shown in Table 9 in Appendix A. Note that a reconciliation of actual and forecast losses (based on 2008/09 data, escalated for two years) for 2010/11 is shown in Appendix B.

ACIL Tasman:

- have applied the same methodology used for the reports for the past four years to forecast the DLFs by both network segment and region; and
- are satisfied that the calculated DLFs are compliant with Clause 3.6.3 of the Rules

ACIL Tasman recommends:

- the approval of the DLFs for Tasmania for 2012-13 as set out in Tables 1 to 4, covering the seven regions;
- the approval of the site specific DLFs for the five (5) major customers for 2012-13, as set out in Table 8.

[1] Aurora Energy, "Distribution Loss Factor Calculation Methodology", Report # 4246/3 prepared by A. Baitch of BES (Aust) Pty Ltd, July/August 2004.

ACIL Tasman

Economics Policy Strategy

1 Introduction

This report follows the same methodology adopted for the report for the DLF forecasts undertaken from 2008-09. We have worked with the Aurora personnel to assess the data for consistency and reliability and acknowledge the assistance from the graduate engineer and other Aurora staff assigned to provide the network data for 2010-11.

1.1 Background

Aurora's distribution network is connected to the transmission system, owned by Transend Networks Pty Ltd (Transend), at 40 connection sites throughout Tasmania, where the voltage is reduced from 110kV to 44, 33, 22 and 11kV[2].

The actual distribution connection points, and the asset boundaries between the distribution and transmission networks, for the sub-transmission and distribution feeders, emanating from these connection sites, are on the load side of the Transend-owned feeder circuit breaker equipment.

The boundary between the transmission and distribution networks in Tasmania is somewhat unique. Transformers and switchgear at 110kV substations are treated as transmission connection assets, in contrast to other states where these assets would be considered as distribution connection assets.

Clause 3.6.3 (g) of the Rules requires a DNSP to determine DLFs for all connection points on its distribution network in accordance with either:

- the methodology developed, published and maintained by the Jurisdictional Regulator for the determination of DLF; or
- the methodology developed, published and maintained by the DNSP for the determination of DLF, where the Jurisdictional Regulator has not published a methodology.

The Rules require a DNSP to determine each year the DLFs to apply in the next financial year and provide these to AEMO for publication. The AER requires Aurora to submit its proposed DLFs for the 2012-13 financial year by 1 April 2012 for approval and subsequent submission to AEMO.

[2] In previous years, we included the 44kV in the 33kV zone subs and while these were double counted, the impact is immaterial

1.2 Scope

The scope of this engagement with Aurora is limited to the following:

- Develop a spreadsheet model for computation of and report on the forecast DLFs for the 2012-13 financial year, in accordance with the relevant rules and the agreed methodology, based on data supplied by Aurora for 2010-11. The forecast DLFs and report will be made available to the AER and AEMO to meet Aurora's National Electricity Rule requirements.
- The report is also expected to comment on Aurora's compliance with clause 3.6 of the National Electricity Rules in the determination of DLFs.
- ACIL Tasman is expected to:
  - coordinate activities necessary to carry out the assessment of losses to an acceptable level of accuracy;
  - to provide knowledge of the process;
  - to train identified Aurora employees, in particular a graduate engineer, as part of their Graduate program.

This report is ACIL Tasman's draft report in relation to this engagement and covers all aspects required by Aurora as set out in the scope above.

1.3 Issues

We have identified a number of issues that need to be considered by Aurora.

- ACIL Tasman developed a spreadsheet model, "DLF Calculator 2012-13" to be used by Aurora to add data from their FLRS (Feeder Load Reporting System), requiring the manipulation of very large quantities of data.
- Although a concerted effort was undertaken, the potential for error from data re-entry remains. It is recommended that any source and intermediate data is extracted and captured in the DLF model directly to allow for an adequate data trail.
- Aurora has made a number of assumptions in the methodology and in applying the methodology. These assumptions include:
  - excluding the impacts of kVAr flows on distribution system losses;
  - assuming constant system voltages in calculating the losses across transformers;
  - assuming average network-wide results for distribution transformers (eg. LLF, no load loss and full load series loss);
  - conversion of PAYG revenue to energy data (kWh) and allocation to post codes (where bought not where used); and

- Non-technical losses (including unbilled energy, metering error and theft) are approved by AER at 0.5%.

As OTTER has previously approved the grouping of various transmission points in both Hobart and Launceston to form two virtual transmission nodes, Aurora has calculated loss factors in those two regions on that basis.

DLFs for 2012-13 have again been calculated for seven (7) regions in total, as follows:

- Hobart;
- Tamar (incorporates Launceston);
- East Coast;
- North West;
- West Coast;
- Derwent (incorporates the Highlands area); and
- Southern (area south of Hobart).

These geographical regions are based on the distribution network configurations from both Aurora Zone Substations and Transend's Terminal Substation assets in order to minimise the influence between regions with respect to energy flows and distribution system switching.

The loads and consumption data for substations within a region may be subject to significant variations due to network configuration rearrangements, particularly in the Hobart and Tamar regions that have undergone significant augmentation, resulting in load shifting between adjacent zone and terminal substations. Evaluation of the load and consumption data and the subsequent system analysis and data adjustments to recognise normal operating conditions have minimized these variations.

1.4 Material reviewed

The following documents were used to prepare the forecast 2012-13 DLFs:

- Aurora Energy, Distribution Loss Factor Calculation Methodology, July/August 2004;
- The National Electricity Rules – Clause 3.6.3 and associated clauses and definitions; and
- Energy growth forecasts were obtained from a model prepared by ACIL Tasman in late 2011, with energy consumption forecast to increase by 0.81% pa from 2010/11 to 2016/17. In contrast to previous years, there was only an overall network energy forecast and no Regional forecast.

In addition, ACIL Tasman worked with Aurora staff to review the collected data and to address any issues/abnormalities found during this study.

2 Aurora's data

ACIL Tasman has relied on Aurora for the accurate sourcing and calculation of data items including:

- Historical and forecast energy usage and losses for specific customers used to calculate site specific DLFs;
- For the entire network, forecast energy growth is **0.56% pa**, resulting in total energy sales increasing from 4,417 GWh in 2010-11 (actual[3]) to 4,467 GWh in 2012-13 (forecast[4]);
- Aurora historical sales at each voltage level on both a state-wide and regional (postcode) basis;
- For the sub-transmission system, shunt and full load series losses (kW), Load Factors (LF) and Loss Load Factors (LLF);
- For the zone substations, shunt and full load series losses (kW), maximum demand (MD) and LLF;
- For the distribution feeders, feeder loadings, Line Loss, LF and LLF;
- For the distribution transformers, assumed LLF, average full load series loss, load utilisation factor and no load loss in %.

2.1 Data collection for the 2010-11 financial year

Data regarding the transmission network flows and losses were mainly extracted from Aurora's FLRS database - used to calculate the LF and the LLF for each distribution feeder (around 300 in total).

This database contains the Average, Root Mean Square (RMS) and Maximum Demand (MD) loading in kW for the distribution feeders. The FLRS database is uploaded daily with data from Transend Networks and Aurora's SCADA system in Hobart.

The MD loading data was also used to determine distribution line losses and utilisation factors from load flows on each of the distribution feeders. Coincident MD data was manually extracted from the FLRS database to determine the Coincident Factor. The extracted data had to be checked and, in some cases, manually adjusted to correct for erroneous data.

Due to load transfers within substations and between distribution feeders, the MD on many of the feeders had to be checked and, in some cases, adjusted. This was to ensure that the change in load was taken into account and that no

[3] Includes Sales of 327 GWh for five (5) Major Customers of Aurora Retail

[4] No growth is assumed for the five Major Customers

load was included more than once. As a result of these changes, the Average and RMS loadings had to be re-calculated on the respective feeders to reflect the transfer of load. We recommend a log for material feeder changes during the year is maintained.

For 2010/11, Transend Purchases of 4,598 GWh represent a 1.3% decrease on purchases of 4,658 GWh in 2009/10. When embedded generation (including16 GWh for small scale solar) of 56 GWh is added to Transend Purchases, total purchases by Aurora increased to 4,654 GWh in 2010/11. This total is 44 GWh less than for 2009/10.

2.2 Data Processing and Validation by ACIL Tasman

In the process of calculating the 2012-13 DLF factors, ACIL Tasman encountered a number of data issues. Firstly, PAYG sales data represents an estimate of sales by region as this data is not recorded as energy but rather as cost. Although the data was available by post code, it reflects point of sale rather than consumption. We note that PAYG sales have fallen for the second consecutive year from 357 GWh in 2009-10 to 336 GWh in 2010-11.

Secondly, there was a small difference in the total energy sales data and that provided by zip code and this was attributed to data for Flinders and King islands.

Nevertheless, it should be noted that the above listed data issues are immaterial to the overall calculation of Aurora's distribution network DLFs.

Raw data extracted from Aurora's various systems was directly integrated into the spreadsheet model wherever possible in order to minimise data input errors. The data extracted was disaggregated on a regional/postcode level and as such had to be aggregated into the defined regions within the model. Furthermore, the data has been validated against past data, using sensitivity analysis, with the output edited in order to ensure data quality and to identify specific data points for further investigations. Data points identified were consequently individually validated within the FLRS database.

As Aurora completed an energy consumption forecast to support its tariff application for the next regulatory period, we have adopted this forecast growth of 0.56% pa for the two years to 2012-13.

3 Methodology

3.1 Definition of segments

The 2012-13 DLFs are calculated for the following five network segments:

- Sub-transmission
- Zone substations (15 zone substations, eight in the greater Hobart area and another seven in various rural locations) which reduce the voltage from 44, 33 or 22kV to 22 or 11kV)
- HV distribution network (387 feeders and 28,730 distribution substations, which further reduce the voltage to a nominal 230/400 volts to supply the majority of Aurora's customers.)
- Distribution sub-stations and
- LV distribution network

ACIL Tasman considers that this is an appropriate network breakdown and that it is consistent with the principles set out in NER Clause 3.6.3 (h). We also note that the breakdown is consistent with network segments used by DNSPs in other NEM jurisdictions.

Note that due to further tranches of contestability and an increase in the number of retailers in Tasmania (previously only Aurora Retail), it is no longer appropriate to match network tariffs to retail tariffs. Accordingly, it was necessary to derive a correlation, particularly for customers connected to the HV network.

3.2 Calculating losses by steps

ACIL Tasman has adopted the same methodology for calculating DLFs for 2012-13 as used by Aurora in previous years, namely a series of steps as follows:

1. Total energy flowing *into* the Aurora Distribution network is derived for the 2012-13 year by applying the annual growth rate (derived from 5-year energy growth forecast to 2016-17) to Transend purchases in 2010-11 (two years' growth at 0.56% per year) and adding the purchases for site specific customers and from embedded generators[5], both of which are assumed to be constant (no growth)
2. Calculate the site specific losses for major customers.
   These losses are calculated from metered quantities and forecast annual consumption – typically assumed as unchanged from year to year. These

[5] Includes small scale solar plants (16 GWh) for the first time in total of 56 GWh

losses are used to derive loss factors for each of the customer specific sites. Residual energy flows are determined by subtracting the sales to specific customers. Specific customer losses are not subtracted from residual sales at this point as they are included variously at the sub-transmission, zone and HV network segments as allocated losses.

3. Calculate the Sub-Transmission segment losses.
   These losses are calculated from metered quantities and DINIS load flow modelling. After these losses have been calculated, any losses already allocated to specific customer sites are subtracted, with the remainder being used to determine the sub-transmission loss factor as a percentage of residual flows. Finally, the sub-transmission losses are subtracted from the residual flows before moving to the next step.
4. Calculate the Zone Substation (ZS) segment losses.
   These losses are calculated from metered quantities supported by load flow modelling. These losses include both shunt (wires) and series (transformers) losses as required under the methodology. As some of the ZS losses are already allocated to specific customer sites, these are subtracted from the total losses calculated for this section. The remaining losses are used to determine the ZS loss factor as a percentage of residual flows. Finally the ZS losses are subtracted from the residual flows before moving to the next step.
5. Calculate the HV Distribution segment losses.
   These losses are calculated from metered quantities and distribution feeder modelling. As some of the HV Distribution losses are already allocated to specific customer sites, these are subtracted from the total losses calculated for this segment. The remaining losses are used to determine the HV loss factor as a percentage of residual sales. Aurora has a number of customers directly connected to the HV Distribution as well as some embedded generators. Hence the HV customer sales and the HV Distribution losses are subtracted from the residual flows and the embedded generation is added to the residual flows before moving to the next step.
6. Calculate the Distribution Substation segment losses.
   Distribution Substation losses are calculated from an assumed LLF of 25%, averaged over the entire network and actual utilisation factors calculated for each feeder. Losses are calculated by summing across all distribution transformer assets in Tasmania. The Distribution Substation loss factor is then calculated as a percentage of residual flows. As Aurora has a number of customers directly connected to the LV system, both the LV direct customer sales and the Distribution Substation losses are subtracted from the residual flows before moving to the next step.
7. Calculate the LV Distribution segment losses.
   The losses in the LV Distribution are based on the energy balance for the whole system. The losses are calculated by determining the total system losses by subtracting energy sold (metered) and non-technical losses from energy purchased (includes embedded generation). The LV Distribution

losses are then determined as the residual losses after subtracting all other segment losses calculated in each of the previous steps. The LV Distribution loss factor is then calculated as a percentage of residual flows and is the same for each Region as allocated by proportion of sales.

8. Losses are then allocated to each of the regions using either a proportion of sales in each region for LV segment losses or transformer capacity for HV and transformer segment losses. Loss factors are calculated for each segment in each region from the allocated losses/residual sales in the region. The sales information for each segment by region is derived from Aurora's retail billing system information that provides sales by tariff class. The tariff classes are mapped to the appropriate segment. It is assumed that the proportion of sales by region in each segment remains constant.
9. Finally the cumulative loss factor to be applied to each segment in each region is calculated by combining the segment loss factor with each upstream loss factor as follows:

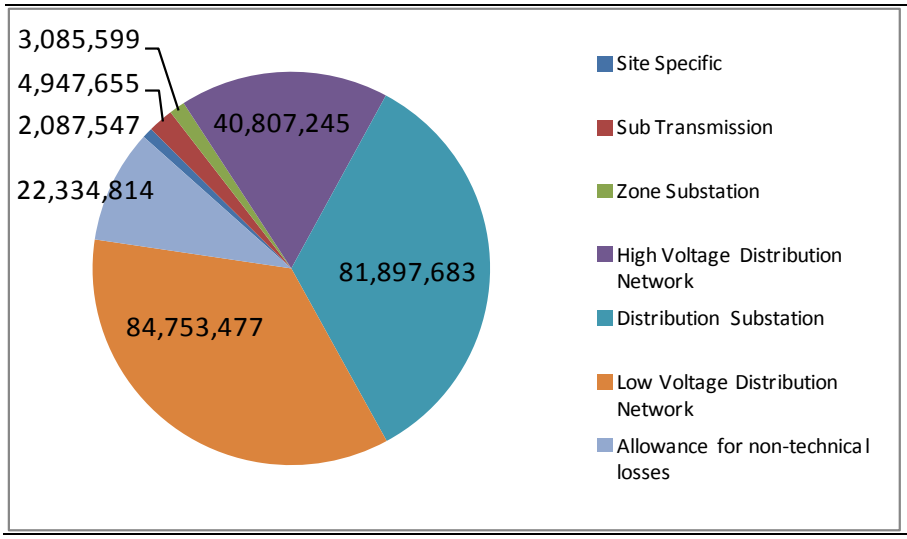
   $$\text{Cumulative } DLF_n = (1+DLF_1)*\ldots *(1+DLF_{n-1})*(1+DLF_n) - 1$$

   where 1 to n represent the current and upstream segment DLFs used in the calculation with 1 representing the sub-transmission segment through to n representing the current segment.

4 Results

Figure 1 shows the forecast losses (kWh) for 2012-13, calculated for each distribution network segment and the estimated non-technical losses. The total distribution network losses for 2012-13 are estimated at 239,914,021 kWh - 0.56% pa higher than the actual losses (237.2 GWh) for 2010-11.

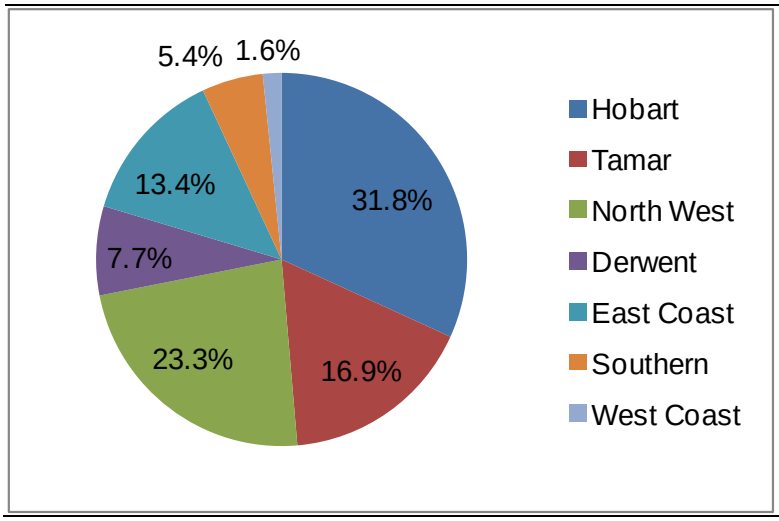
Figure 1 **Forecast losses (kWh) for 2012-13 by network level**



Data source: ACIL Tasman analysis

Figure 2 shows the forecast losses for 2012-13 by Region as a percentage of total network losses.

Figure 2 **Forecast energy losses (% Total) for 2012-13 – by Region**



Data source: ACIL Tasman analysis

Hobart, Tamar and North West regions account for 31.8%, 16.9% and 23.3% of the total forecast losses respectively.

Aurora's forecast DLFs for 2012-13 are shown in the following Tables:

- Table 1- Hobart
- Table 2 - Tamar
- Table 3 -North West
- Table 4 - Derwent
- Table 5 - East Coast
- Table 6 – Southern
- Table 7 - West Coast

Table 1 **Distribution Loss Factors for 2012-13 – Hobart region**

2012-13	Hobart		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.33%	0.33%	0.33%
Zone Substation	0.20%	0.52%	0.52%
High Voltage Distribution Network	0.82%	1.35%	1.35%
Distribution Substation	1.59%	2.96%	3.55%
Low Voltage Distribution Network	2.75%	5.79%	6.39%
Allowance for non-technical losses	0.57%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 2 **Distribution Loss Factors for 2012-13 – Tamar region**

2012-13	Tamar		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.00%	0.00%	0.00%
Zone Substation	0.00%	0.00%	0.00%
High Voltage Distribution Network	0.83%	0.83%	0.83%
Distribution Substation	1.76%	2.61%	3.22%
Low Voltage Distribution Network	2.75%	5.43%	6.05%
Allowance for non-technical losses	0.59%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 3 **Distribution Loss Factors for 2012-13 – North West region**

2012-13	North West		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.00%	0.00%	0.00%
Zone Substation	0.00%	0.00%	0.00%
High Voltage Distribution Network	1.19%	1.19%	1.19%
Distribution Substation	2.44%	3.66%	4.37%
Low Voltage Distribution Network	2.75%	6.51%	7.24%
Allowance for non-technical losses	0.69%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 4 **Distribution Loss Factors for 2012-13 – Derwent region**

2012-13	Derwent		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.00%	0.00%	0.00%
Zone Substation	0.00%	0.00%	0.00%
High Voltage Distribution Network	1.45%	1.45%	1.45%
Distribution Substation	2.74%	4.24%	4.82%
Low Voltage Distribution Network	2.80%	7.16%	7.76%
Allowance for non-technical losses	0.55%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 5 **Distribution Loss Factors for 2012-13 – East Coast region**

2012-13	East Coast		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.00%	0.00%	0.00%
Zone Substation	0.00%	0.00%	0.00%
High Voltage Distribution Network	1.82%	1.82%	1.82%
Distribution Substation	3.59%	5.48%	6.09%
Low Voltage Distribution Network	2.75%	8.38%	9.00%
Allowance for non-technical losses	0.58%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 6 **Distribution Loss Factors for 2012-13 – Southern region**

2012-13	Southern		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.00%	0.00%	0.00%
Zone Substation	0.00%	0.00%	0.00%
High Voltage Distribution Network	1.57%	1.57%	1.57%
Distribution Substation	3.13%	4.75%	5.32%
Low Voltage Distribution Network	2.75%	7.63%	8.21%
Allowance for non-technical losses	0.54%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

Table 7 **Distribution Loss Factors for 2012-13 – West Coast region**

2012-13	West Coast		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.22%	0.22%	0.22%
Zone Substation	0.19%	0.41%	0.41%
High Voltage Distribution Network	0.18%	0.59%	0.59%
Distribution Substation	2.12%	2.73%	4.39%
Low Voltage Distribution Network	2.75%	5.55%	7.26%
Allowance for non-technical losses	1.62%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

4.1 Conclusions and Recommendations

Network losses in 2010-11 of 237.2 GWh equate to 5.37% of Aurora's total sales of 4,417 GWh (5.10% of total purchases).

The proposed site specific loss factors for 2012-13 are listed in Table 8.

Table 8 **2012-13 Site Specific DLFs recommended for approval**

Major Customer	NMI	Region	DLF Code	DLF
Australian Cement (Railton)	8000003585	North West	PACH	1.0000
Simplot (Ulverstone)	8000000656	North West	PSPU	1.0034
Beaconsfield Gold (Beaconsfield)	8000003691	Tamar	PBGM	1.0118
Bluestone Mine (Renison)	8000003578	West Coast	PBSM	1.0094
Henty Goldfields	8000003868	West Coast	PHGM	1.0000

Data source: ACIL Tasman analysis

ACIL Tasman confirms that the calculation of Aurora's forecast DLFs for 2012-13 complies with the requirements of Rules Clause 3.6.3.

.

A Aurora Distribution Network DLF

Table 9 **Aurora overall DLF forecast by network segment for 2012-13**

2012-13	TOTAL		
Network Level	Effective Section Loss Factor %	Cumulative Loss Factor % (no non-technical losses)	Cumulative Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.12%	0.12%	0.12%
Zone Substation	0.07%	0.19%	0.19%
High Voltage Distribution Network	1.08%	1.27%	1.27%
Distribution Substation	2.19%	3.49%	4.13%
Low Voltage Distribution Network	2.75%	6.34%	6.99%
Allowance for non-technical losses	0.61%		

a Non-technical losses applied to Cumulative Distribution sub-station and LV distribution only

Data source: ACIL Tasman analysis

B Losses reconciliation for 2010/11

For 2010/11, the forecast losses and DLF factors, based on the actual data for 2008/09 (escalated by two years), are compared with the actual losses and DLF factors in Table 10.

Table 10 **Reconciliation of forecast and actual DLFs and losses for 2010/11**

	2010/11 - Forecast		
Network Level	Effective Section Loss Factor %	Cum Loss Factor % (no non-technical losses)	Cum Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.11%	0.11%	0.11%
Zone Substation	0.07%	0.19%	0.19%
High Voltage Distribution Network	1.18%	1.36%	1.36%
Distribution Substation	2.33%	3.73%	4.36%
Low Voltage Distribution Network	2.80%	6.64%	7.29%
Allowance for non-technical losses	0.61%		

	2010/11 – ACTUAL		
Network Level	Effective Section Loss Factor %	Cum Loss Factor % (no non-technical losses)	Cum Loss Factor % (inc. non-technical losses)
Subtransmission Network	0.12%	0.12%	0.12%
Zone Substation	0.07%	0.19%	0.19%
High Voltage Distribution Network	1.08%	1.27%	1.27%
Distribution Substation	2.19%	3.49%	4.13%
Low Voltage Distribution Network	2.75%	6.34%	6.99%
Allowance for non-technical losses	0.61%		

	Forecast	Actual	Difference
Network losses, kWh	268,632,525	237,230,515	31,402,010
Network losses, GWh	268.6	237.2	31.4

Data source: ACIL Tasman analysis

Forecast Losses were 31.4 GWh more than Actual Losses and this error represents 0.71% of Sales of 4,417.0 GWh. Actual losses represent 5.37% of Sales. Actual sales for 2010/11 were 20 GWh less than for 2009/10.